# Nanoscale Crystallography Reveals Structural Details

Understanding the properties of nanoscale materials may allow scientists to manipulate these properties to produce new nanomagnets, nanocatalysts, and composites with better optical properties. But such applications require detailed knowledge of the materials' atomic level structure.

"Without a structure, you are without a road map," said Thomas Vogt, BNL Physics Department. Funded by DOE's Office of Basic Energy Science and the National Science Foundation, Vogt and scientists from Michigan State University (MSU), led by MSU physicist Valeri Petkov, have demonstrated a technique that allows them to decipher such fine-level nanostructures.

The researchers' analysis of a material composed of cesium ions trapped inside nano-sized pores of the silicon-oxide zeolite $Si_{32}O_{64}$ is described in *Physical Review Letters* of August 12, 2002. This material is also the first example of a room-temperature inorganic "electride," a stable separation of positively charged cations and electrons, with properties determined by the topology of the pores in the host matrix.

Nanoscale structures — made of particles 1,000 times smaller than the diameter of a human hair — are so difficult to decipher because they lack the long-range order and symmetry of perfectly crystalline materials.

"This work shows that, even with a very low degree of order, at synchrotrons such as the NSLS, and using the right techniques, we can determine nanoscale structures. And with structural understanding, we can begin to predict properties, and perhaps begin to manipulate them for useful applications," said Vogt.

-Karen McNulty Walsh

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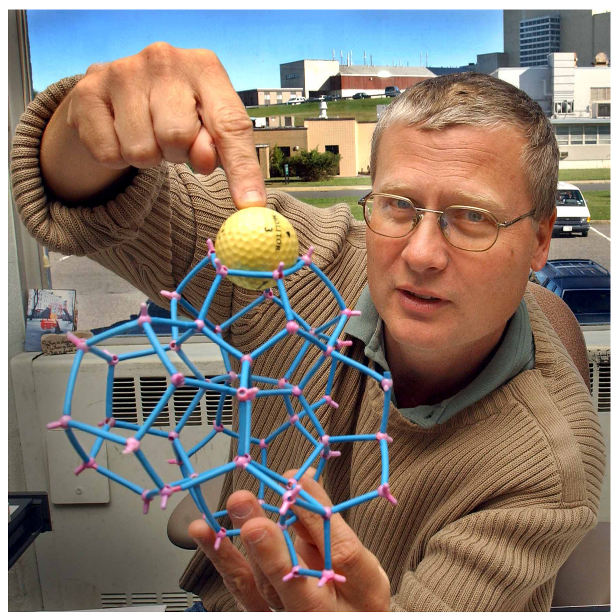

*Tom Vogt of BNL's Physics Department illustrates the location of a cesium atom (golf ball) in the nanopores of a zeolite — a structure determined using methods of nanocrystallography*